

tions in the water are due to the direct action of atmospheric waves or billows, or more properly speaking, oscillations of barometric pressure passing over the harbors and bays. To the Editor it seems that it would be much better to study the barometric oscillations directly as a meteorological problem, and, subsequently, to study their effect on the tides as an oceanic problem; but Mr. Denison finds reason to reverse the order of treatment. His results are of interest to those studying the oscillations of lakes and bays even if they are not so important to the meteorologist, and many readers of the MONTHLY WEATHER REVIEW will be interested in the following quotations from Mr. Denison's paper in the Proceedings of the Canadian Institute for November, 1898:

In 1838 this phenomenon was observed at Swansea, England, where a regular time interval of from fifteen to twenty minutes was noted. Some of these records were sent to Sir George Airy, who was then unable to account for them. Admiral Smythe referred to this phenomenon at Malta, where it had long been termed "mirobia," and supposed to be due to distant storms. In 1878, Sir George Airy read a paper before the Royal Society upon the tides of Malta, in which he speaks of these undulations as simple harmonic curves, whose heads are sometimes notched as by the intermixture of small waves. That they had a time interval of twenty-one minutes and a range of 12 inches amplitude, much exceeding that of the lunar tides. He believed that they were "seiches" similar to those discovered by Forel upon the Swiss lakes, and supposed them due to a reflexive action from the shores of Sicily and the African coast. Major Baird of the Indian Tidal Survey, referred to this phenomenon in 1868 as being most pronounced at the ends of bays, but offered no explanation. In 1896, Professor Duff, of Purdue University, studied these undulations at St. John, N. B., and Indian town, and later presented a paper before the Royal Society of Canada, in which he also classed them as "seiches," due to some form of oscillation between the two sides of the Bay of Fundy. He does not attempt any explanation for the abnormal movements often observed during fine settled weather. Mr. H. C. Russell, of New South Wales, states that at Sydney what have been previously termed earthquake waves are in most cases due to atmospheric disturbances in some yet ill-defined manner, and have a marked 26-minute time interval from crest to crest.

Finally, these undulations are universal to a greater or less extent, as has been proved by a personal study of tidal records observed from all parts of the world.

CHIEF POINTS DEDUCED.

1. That the undulations are due to the direct action of atmospheric waves upon the surface of the water at stations, and not to ground swells due to distant storms or seiche movements, as found upon lakes during atmospheric disturbances.
2. There is a marked relative correspondence in amplitude between the barometric and water undulations.
3. That they often appear during fine settled weather, when the barometer is high over the station, but decidedly low to the southwest, frequently when over 1,000 miles distant.
4. That they increase in amplitude as the storm advances, the maximum usually occurring shortly before and at the time of the shift of wind, which also corresponds with the time of heaviest precipitation. This tends to prove that the axis of rotation of important storms is inclined toward the direction of its future course.
5. That after the storm has passed the station, these undulations rapidly diminish, although a heavy westerly gale may still be blowing, provided the temperature to the westward is fairly uniform. Should a cold or warm wave be approaching, marked undulations appear.
6. Should a southwest storm move with diminishing energy toward the station, the undulations correspondingly decrease as it approaches.
7. That the tidal records are most disturbed during winter and least in summer, due to the velocity of the primary poleward current being almost double in winter what it is during the summer months.
8. The disturbed traces during the summer months chiefly occur shortly before or at the time of showers or thunderstorms, and usually precede warm and cool waves.
9. Whereas, many of our storms are whirling eddies, developing from above downward, it is hoped a further study of these undulations may throw much light upon their future growth and course, even before the ordinary barometer begins to fall.
10. Meteorologists throughout the scientific world now realize that for the further advancement of weather forecasting, a better knowledge of the upper atmosphere must be obtained. Rapid strides are now being made in this direction by means of kites, balloons, and cloud observations. May we not add the study of atmospheric and water waves at the bottom of this aerial ocean, which can be carried on during all conditions of weather by means of sensitive self-recording instruments that have been fully described in a paper read before the Toronto meeting of the British Association in August, 1897.

BACK NUMBERS OF THE MONTHLY WEATHER REVIEW.

When requests for back numbers of the MONTHLY WEATHER REVIEW are received from those who desire to complete their sets and it appears that the stock on hand in Washington is exhausted, the Editor will mention such cases in the REVIEW, in order that those who are able and willing to supply the desired numbers may have an opportunity to do so. Penalty envelopes will be sent to those who desire to return their copies to the Editor.

No. 13 (Annual Summary, 1892), is desired by Prof. A. Angot, Paris.

The volumes, 1873-1888 are desired by the Secretary of the Canadian Institute at Toronto.

Prof. H. H. Hildebrandsson of Upsala, Sweden, desires the MONTHLY WEATHER REVIEW for the years 1887 to 1891, inclusive.

A NEW ELEMENTARY METEOROLOGY.

An elementary treatise on meteorology has just been published by Alfred Angot, meteorologist to the Central Meteorological Bureau in Paris and professor in meteorology at the National Agronomic Institute, and also at the High School of Navigation. This work is an outcome of Angot's lectures to the students at the two latter institutions rather than a complete treatise on meteorology. It is written for those who desire to become acquainted with the elements of meteorology and is not intended to expound all the facts known at the present time or to discuss critically the theories that have been proposed in order to explain them. Still, no question of any importance has been omitted. The laws of the general phenomena and their theories have been explained in detail but without having recourse to mathematical developments and without assuming that the reader has any but the most elementary knowledge of physics or mechanics.

The preface says:

In a work of this nature it would appear useless to multiply numerical examples, and tables of figures are replaced as far as possible by charts and diagrams. Similarly, we have suppressed the descriptions of instruments and technical details as to the methods of making observations; these questions interest only the observers and professional meteorologists and are to be found fully developed in all collections of meteorological instructions. On the other hand, the author thinks it well to give general indications as to the principles involved in the methods of observation, and the conditions that the observations ought to satisfy, in order to give results worthy of confidence.

Meteorology offers a most varied field of research both in the domain of pure theory and that of its applications; few sciences can be taken up more easily by isolated students and workers who have not at hand the resources of the large laboratories. However, France, which has heretofore played an important part in the development of meteorology, is to-day one of the countries where it is least cultivated; one can assure himself of this fact by looking over the statistics of books published every year in France and foreign countries. This difference is due to the fact that in France there is an entire absence of regular instruction in meteorology and in the physics of the globe. Except in the schools of higher agriculture, meteorology has no place in the curriculum of any of our establishments of higher education; on the contrary, in neighboring countries, including the United States, a large number of special chairs are devoted to it in all the higher schools and in the universities.

These words by Angot must awaken, in every one interested in the subject, a hope that the study of meteorology may be revived in France, and that its importance may become so highly appreciated as to lead to the establishment of courses of instruction in both the lower and higher schools. In America, such instruction is supposed to be an important feature in the ordinary public schools and high schools, so that every citizen may learn to make a wise use of the Daily Weather Map, and a more or less successful, local interpretation of the general forecasts that issue from the Weather Bureau. For this class of students, the beautiful volume by